Summary of U.S. EPA Air Sample Results

El Dorado Hills Naturally Occurring Asbestos Multimedia Exposure Assessment

Results of U.S. EPA Activity-Based Sampling of Personal Asbestos Exposures During Simulated Activities at Selected Public Sports and Play Venues in El Dorado Hills, CA

The attached table summarizes the results of U.S. EPA sampling of asbestos exposures at selected public sports and play venues in El Dorado Hills, CA. In October 2004, U.S. EPA collected samples to evaluate whether people, especially children, who use these public venues could be exposed to elevated levels of asbestos in air. The venues tested were at 3 schools (Silva Valley Elementary, Rolling Hills Middle and Jackson Elementary) and the Community Park in El Dorado Hills.

The asbestos exposure assessment was conducted by having U.S. EPA personnel simulate sport and play activities at these venues while wearing asbestos sampling equipment. The sporting activities included biking, jogging/walking, baseball, basketball and soccer. Play activities at the toddler's playground in the Community Park were also simulated.

During the assessment, U.S. EPA personnel simulating these activities wore personal air samplers to collect air from the typical breathing zone of children and adults. For comparison purposes, stationary samplers were also set up to sample air from areas that were nearby, but outside of the zone of influence of the simulated activity. The goal of the sampling was to compare the personal asbestos exposures during the simulated activities with ambient air asbestos concentrations measured simultaneously in the same general area. Thus the ratio of the personal asbestos exposure to the simultaneous ambient air asbestos concentration is a measure of the elevated exposures created by the activity.

The following table presents comparisons between personal asbestos exposure measurements during the simulated activities and the ambient air asbestos concentrations measured simultaneously. This comparison of asbestos concentrations in an "affected" area (the breathing zone of personnel simulating sports and play activities) with those from an "unaffected" area (the ambient air asbestos concentration) was adopted from the AHERA regulations (40 CFR Part 763; October 30, 1987) covering asbestos in schools.

U.S. EPA analyzed the asbestos fibers from this sampling in two ways: PCME and AHERA. PCME is the acronym for a type of microscope used in asbestos investigations; AHERA is an acronym for the asbestos in schools regulation. PCME fibers are longer than 5 microns, between 0.25 and 3 microns in width and an "aspect ratio" (length divided by width) greater than 3:1. PCME fiber concentrations form the basis for most health studies related to cancers in humans caused by asbestos exposure. PCME fiber concentrations are used by both U.S. EPA and Cal/EPA in asbestos cancer risk assessments. AHERA analysis includes shorter fibers (those greater than 0.5 microns in length) and therefore presents a more complete picture of the concentration of all asbestos fibers that were present.

For each activity scenario listed in the table, three values are presented for both categories of asbestos fibers:

(1) The first column contains the ratio of the average personal asbestos exposure measurement to the average ambient air asbestos concentration measured simultaneously in the same general area. Thus this first column represents the amount ("x-fold") by which personal asbestos exposures during the activity exceed the simultaneous concentration of asbestos in nearby ambient air.

(2) The second column presents the average personal asbestos exposure concentration as measured by the personal samplers during the simulated activity. For most scenarios this value is the average of the asbestos concentration measured in the breathing zone of 5 subjects simulating the activity.

(3) The third column presents the average concentration of asbestos measured in nearby ambient air at the same time the simulated activity was taking place. For most scenarios this value is the average asbestos concentration from 5 stationary samplers collecting nearby ambient air on the same day each activity was occurring.

The value (Average Personal Exposure to Reference) in the first column is derived by taking the ratio of the value in the second column to that of the third. Numeric ratios are presented only for those scenarios where the elevated exposure was determined to be significant by the Z-test statistical procedure specified in the AHERA regulation.

U.S. EPA found that asbestos fibers were present in almost all El Dorado Hills air samples, whether from sports and play activities or from samples collected nearby, but outside, the areas of the activity sampling. The dominant fiber type for most air samples, especially for the longer PCME fibers, was amphibole (mainly actinolite and tremolite). However, short chrysotile fibers were also present at high levels from activities at the Community Park baseball fields and at the children's playground.

U.S. EPA's results showed that personal exposure levels of asbestos were significantly higher during most sports and play activities as compared to nearby asbestos air samples taken outside the areas of activity.

U.S. EPA's results show that engaging in a variety of sports and play activities in the areas tested can expose individuals participating in those activities to significantly elevated levels of amphibole asbestos. In some cases, especially at the Community Park baseball fields, elevations in short-fiber chrysotile exposures were also observed. U.S. EPA observed that play within the children's playground at the Community Park can generate elevated exposure levels for the children playing there. U.S. EPA also found that even when there is no activity at the toddler playground, asbestos levels there are higher because of activities elsewhere in the Community Park.

In most cases, these exposure levels are of concern because of the potential for long-term development of asbestos-related diseases.

Summary of U.S. EPA Sample Results

U.S. EPA Activity-Based Asbestos Exposure Sampling - Community Park, Silva Valley School, Rolling Hills School, & Jackson School, El Dorado Hills, October 2004

Asbestos concentration used for cancer risk assessment. →

Location & Activity Scenario	Long Fibers (PCME) [1, 4]			Total Structures (AHERA) [2, 4]			Comments
	Ratio: Personal Exposure to Reference [3]	*Average of Personal Exposure (f/cc)* [6]	*Reference Concentration (f/cc)* [6]	*Ratio: Personal Exposure to Reference* [3]	*Average of Personal Exposure (s/cc)* [7]	*Reference Concentration (s/cc)* [7]	
New York Trail, ► *Child Biking Scenario*	***43***	***0.0336***	***0.0008***	***23***	***0.0564***	***0.0024***	PCME & short fibers ~ all amphiboles.
New York Trail, ► *Adult Jogging Scenario-B*	***39***	***0.0212***	***0.0005***	***28***	***0.0439***	***0.0016***	PCME & short fibers ~ all amphiboles.
North Field Baseball Diamond, Community Park ► *Child Baseball Game*	***22***	***0.0171***	***0.0008***	***21***	***0.0513***	***0.0024***	PCME mostly amphiboles, including actinolite, amosite & anthrophylite.
South Field Baseball Diamond, Community Park ► *Child Baseball Game A*	***22***	***0.0168***	***0.0008***	***217***	***0.5307***	***0.0024***	PCME mostly amphiboles; short fibers mostly chrysotile.
North/South Soccer Field, Community Park ► *Child Soccer Game*	***16***	***0.0087***	***0.0005***	***11***	***0.0175***	***0.0016***	PCME ~ all amphiboles; short fibers mostly amphiboles.
New York Trail, ► *Adult Jogging Scenario-A*	***12***	***0.0197***	***0.0017***	***10***	***0.0347***	***0.0036***	PCME & short fibers ~ all amphiboles.
Community Park Baseball * ***Adult Observer Exposure***	***11***	***0.0114***	***0.0010***	***21***	***0.0550***	***0.0026***	PCME mostly amphiboles; short fibers mostly chrysotile.
South Field Baseball Diamond, Community Park ► *Pooled Child Baseball Games*	***10***	***0.0118***	***0.0012***	***95***	***0.2823***	***0.0030***	PCME mostly amphiboles; short fibers mostly chrysotile.
Toddler Playground, Community Park, ► *Typical Child Play Scenario*	***10***	***0.0067***	***0.0007***	***60***	***0.0816***	***0.0014***	PCME mostly amphiboles, some chrysotile, edenite & amosite.
Silva Valley Baseball Diamond, Silva Valley Elem School ► *Child Baseball Game A*	***9***	***0.0062***	***0.0006***	***7***	***0.0144***	***0.0021***	Wet conditions. PCME & short fibers ~ all amphiboles.
Silva Valley Baseball Diamond, Silva Valley Elem School ► *Child Baseball Game B*	***7***	***0.0032***	***0.0005***	***5***	***0.0066***	***0.0012***	Wet conditions. PCME & short fibers ~ all amphiboles.
South Field Baseball Diamond, Community Park (Game A) ► *Impact on Toddler Playground*	***6***	***0.0047***	***0.0008***	***7***	***0.0170***	***0.0024***	PCME ~ all amphiboles; short fibers mixed amphibole & chrysotile
Toddler Playground, Community Park, ► *Aggressive Child Play Scenario*	***6***	***0.0040***	***0.0007***	***8***	***0.0110***	***0.0014***	PCME & short fibers mostly amphiboles; some edenite & amosite observed.
New York Trail ► *Adult Observers*	***5***	***0.0053***	***0.0010***	***5***	***0.0123***	***0.0026***	PCME & short fibers ~ all amphiboles.
South Field Diamond, Community Park ► *Child Baseball Game B*	***5***	***0.0089***	***0.0017***	***37***	***0.1333***	***0.0036***	PCME mostly amphiboles; short fibers mostly chrysotile; wincherite observed.
Silva Valley Baseball Diamond, Silva Valley Elem School ► *Baseball & Maintenance*	***4***	***0.0024***	***0.0006***	***NS***	***0.0041***	***0.0021***	Wet conditions. PCME & short fibers ~ all amphiboles.
Rolling Hills Basketball Court, Rolling Hills Middle School ► *Child Basketball Game*	***4***	***0.0017***	***0.0005***	***3***	***0.0043***	***0.0012***	PCME & short fibers mostly amphiboles.
South Field Baseball Diamond, Community Park (Game C) ► *Impact on Toddler Playground*	***3***	***0.0056***	***0.0017***	***15***	***0.0542***	***0.0036***	PCME ~ all amphiboles; short fibers mostly chrysotile

Summary of U.S. EPA Sample Results

U.S. EPA Activity-Based Asbestos Exposure Sampling - Community Park, Silva Valley School, Rolling Hills School, & Jackson School, El Dorado Hills, October 2004

Asbestos concentration used for cancer risk assessment. →

Location & Activity Scenario	Long Fibers (PCME) [1, 4]			Total Structures (AHERA) [2, 4]			Comments
	Ratio: Personal Exposure to Reference [3]	*Average of Personal Exposure (f/cc)* [6]	*Reference Concentration (f/cc)* [6]	*Ratio: Personal Exposure to Reference* [3]	*Average of Personal Exposure (s/cc)* [7]	*Reference Concentration (s/cc)* [7]	
North/South Soccer Field, Community Park ► *Impact on Toddler Playground*	*3*	*0.0016*	*0.0005*	*3*	*0.0044*	*0.0016*	PCME mostly amphiboles; short fibers mixed amphibole & chrysotile.
North Field Diamond, Community Park ► *Impact on Tot Lot*	*3*	*0.0021*	*0.0008*	*NS*	*0.0035*	*0.0024*	PCME & short fibers ~ all amphiboles.
Rolling Hills Soccer Field, Rolling Hills Middle School ► *Child Soccer Game*	*3*	*0.0013*	*0.0005*	*NS*	*0.0017*	*0.0012*	PCME & short fibers mostly amphiboles
Jackson Elem School Basketball Game	*3*	*0.0026*	*0.0010*	*3*	*0.0075*	*0.0022*	PCME ~ all amphiboles; short fibers mostly amphiboles.
New York Baseball Diamond, Community Park ► *Impact on Toddler Playground*	*2*	*0.0013*	*0.0005*	*NS*	*0.0011*	*0.0016*	PCME ~ all amphiboles; short fibers mixed amphibole & chrysotile
South Field Baseball Diamond, Community Park (Game B) ► *Impact on Toddler Playground*	*NS*	*0.0028*	*0.0017*	*4*	*0.0159*	*0.0036*	PCME ~ all amphiboles; short fibers mixed amphibole & chrysotile
New York Trail, **** South Perimeter Sampling***	*NS*	*0.0009*	*0.0005*	*3*	*0.0037*	*0.0012*	PCME ~ all amphiboles; short fibers mostly amphiboles.
New York Trail, **** North Perimeter Sampling***	*NS*	*0.0004*	*0.0005*	*NS*	*0.0006*	*0.0011*	PCME & short fibers ~ all amphiboles.
Rolling Hills School Basketball & Soccer **** Adult Observer Exposure***	*NS*	*0.0012*	*0.0005*	*NS*	*0.0033*	*0.0012*	PCME mostly amphiboles; short fibers mixed amphibole & chrysotile.
Overall mean - Northern reference samples.			*0.0009*			*0.0021*	
Overall mean - Southern reference samples.			*0.0008*			*0.0021*	
			(f/cc)			*(s/cc)*	

Notes:
Statistical significance of elevated exposure determined by Z-test (AHERA) - "NS" = not significant
[1] PCME fibers = fibers longer than 5 microns with a width between 0.25 and 3 microns, and an aspect ratio (length to width) greater than 3:1
[2] "AHERA structures" = structures longer than 0.5 microns with an aspect ratio greater than 3:1 (Note this differs somewhat from the strict AHERA fiber definition.)
[3] Ratio = average asbestos concentration from personal samples collected during simulated activity divided by the average asbestos concentration from "reference" samples
[4] Fiber counts are from direct analysis of PCM filters using ISO 10312 procedure.
[5] Reference Concentration refers to the average asbestos concentration measured on the same day by 5 stationary monitoring stations. These reference stations were located in the general study area, but outside of the zone of influence by the activity.
[6] f/cc = fibers per cubic centimeter
[7] s/cc = structures per cubic centimeter